

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-266695

(43)Date of publication of application : 28.09.2001

(51)Int.Cl.

H01H 13/04

G06F 3/02

H01H 13/06

(21)Application number : 2000-084755

(71)Applicant : NIPPON SEIKI CO LTD

(22)Date of filing : 22.03.2000

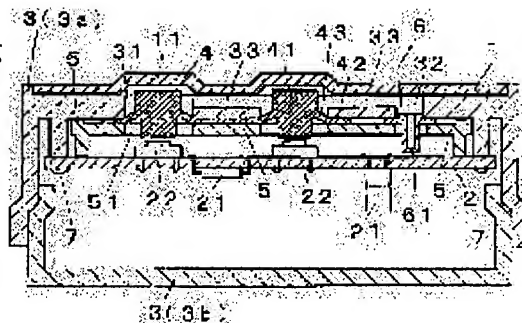
(72)Inventor : MURAYAMA KOHEI

## (54) OPERATING PANEL

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide an operating panel having high waterproof function and capable of preventing deformation of a panel sheet.

**SOLUTION:** The panel is provided with the panel sheet 1 having operating parts 11 which is elastically deformable by a pushing operation, a supporting body 3 having an operating hole 31 which is positioned on the back side of the panel sheet 1 and opened corresponding to the operating part 11, and a vent hole 32 which is positioned on the back side of the panel sheet 1 and formed by piercing a circuit board 2 having a switch 22 in a position corresponding to each of the operating parts 11; and an elastic member 4, which has operating axis parts 41 activating each of the switches 22 corresponding to the pushing operation of the operating part 11, and by which the operating hole 31 is closed from the back side of the supporting body 3. A vent passage 33 is provided on the front side of the supporting body 3 for communicating the operating hole 31 and the vent hole 32, and a pressure absorbing member 6 having a pressure absorbing part 61 for absorbing change of air pressure is provided on the vent hole 32.



### \* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

## CLAIMS

---

**[Claim(s)]****[Claim 1]**A navigational panel comprising:

A panel sheet which has a final controlling element in which elastic deformation is possible by pressing operation.

A base material which is located in the back side of an operating hole which is located in the back side of said panel sheet, and carries out an opening corresponding to said final controlling element, and said panel sheet, and has a vent by which penetration formation is carried out.

The circuit board which has a switch in a part corresponding to said final controlling element.

A pressure absorption member which has a pressure absorption part which is provided with an elastic member which takes up said operating hole from the back side of said base material while having an operation shaft part which operates said switch according to pressing operation of said final controlling element, connects said operating hole and said vent, and absorbs air pressure change to said vent.

**[Claim 2]**The navigational panel according to claim 1, wherein said pressure absorption member is provided with waterproofness and is being fixed to said base material by a watertight state.

**[Claim 3]**The navigational panel according to claim 2, wherein said pressure absorption member is formed in said elastic member and one.

---

[Translation done.]

**\* NOTICES \***

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

---

**DETAILED DESCRIPTION****[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]**Electronic equipment, such as vehicles, such as special vehicles and marine vessels, such as construction machinery, or a car, or a remote control, and copy machinery, etc. are equipped with this invention, and it relates to the navigational panel which operated apparatus by carrying out pressing operation of the final controlling element on a panel sheet (display substrate) in a fingertip.

**[0002]**

**[Description of the Prior Art]**Generally, since the device which adopts this kind of navigational panel is used for special vehicles, marine vessels, etc., such as construction machinery, an airtight high structure has been used for it, for example so that neither water nor pride may enter into the inside of a device.

**[0003]**If it is in the navigational panel in which what stores the circuit board to the inside especially in said device is common, and is used under environment, such as weather-beaten, it is necessary to have the final controlling element which took airtightness into consideration that permeation of

the storm sewage from a final controlling element, etc. should be prevented. Then, the laminated panel sheet which has the elasticity of one sheet constitutes a final controlling element, and there are some which improve the airtightness of said device (for example, JP,8-7162,A).

[0004]However, even if it was the structure using such a panel sheet, the crack and the crack might arise on the laminated panel sheet, water and dust entered inside [ said ] the device from the crack or the portion of the crack, and there was a possibility that the circuit board might be damaged. Then, as shown in drawing 4, the elastic member C closes the operating hole B which penetrates the base material A which constitutes a device from the back side, It protects from the front-face (figure Nakagami) side that water etc. infiltrate into the inside of the device provided with the circuit board E which has the switch D, and what takes double waterproof construction with the panel sheet F is known.

[0005]

[Problem(s) to be Solved by the Invention]With however, the air which the air which exists in this space follows this structure on the temperature change of the open air, and it may expand, may contract [ the space sealed with the base material A, and the elastic member C and the panel sheet F may be formed, and ] it, and was contracted. With the pressure of the air which expanded it may change into the state where collapsed the final controlling element of the panel sheet, or the elastic member was thrust up and the operation feeling which gets across to a fingertip not only differs from usual in the case of pressing operation, but. The panel sheet F had been extended and there was a possibility that the fault of not returning to the original shape or removing the panel sheet F from the base material A might arise.

[0006]Then, waterproofness of this invention is high and an object of this invention is to provide the navigational panel which moreover prevents breakage of modification of a panel sheet etc.

[0007]

[Means for Solving the Problem]A panel sheet on which this invention has a final controlling element in which elastic deformation is possible by pressing operation, A base material which is located in the back side of an operating hole which is located in the back side of said panel sheet, and carries out an opening corresponding to said final controlling element, and said panel sheet, and has a vent by which penetration formation is carried out, It has the circuit board which has a switch in a part corresponding to said final controlling element, and an elastic member which takes up said operating hole from the back side of said base material while having an operation shaft part which operates said switch according to pressing operation of said final controlling element, A pressure absorption member which has a pressure absorption part which connects said operating hole and said vent, and which absorbs air pressure change to said vent is provided.

[0008]Said pressure absorption member is provided with waterproofness, and is being fixed to said base material by a watertight state.

[0009]Said pressure absorption member is formed in said elastic member and one.

[Embodiment of the Invention]The panel sheet 1 on which the navigational panel by this invention has the final controlling element 11 in which elastic deformation is possible by pressing operation, The base material 3 which is located in the back side of the operating hole 31 which is located in the back side of the panel sheet 1, and carries out an opening corresponding to the final controlling element 11, and the panel sheet 1, and has the vent 32 by which penetration formation is carried out, It has the circuit board 2 which has the switch 22 in the part corresponding to the final controlling element 11, and the elastic member 4 which takes up the operating hole 31 from the back side of the base material 3 while having the operation shaft part 41 which operates the switch 22 according to the pressing operation of the final controlling element 11, The aeration way 33 which connects the operating hole 31 and the vent 32 with the front-face side of the base material 3 is formed, and the pressure absorption member 6 which has the pressure absorption part 61 which absorbs air pressure change to the vent 32 is formed. By constituting in this way, waterproofness can be high, and can absorb the pressure of the air which expanded in the pressure absorption part

61, and can prevent modification of the panel sheet 1 etc.

[0010]The pressure absorption member 6 is provided with waterproofness, and is being fixed to the base material 3 by the watertight state. Even when the panel sheet 1 exfoliates from the base material 3, the vent 32 is exposed and water etc. permeate into the vent 32 according to aging etc. by constituting in this way, permeation of water can be pressed down by the pressure absorption member 6.

[0011]The pressure absorption member 6 is formed in the elastic member 4 and one. By constituting in this way, part mark can be reduced, cost can be reduced and it can provide with a navigational panel cheaply.

[0012]

[Example]Hereafter, based on an accompanying drawing, the navigational panel for carrying out control operation of the construction machinery is mentioned as an example, and is explained.

Drawing 1 shows the sectional view of the navigational panel in the 1st example of this invention, and drawing 2 is an important section exploded perspective view of the panel sheet of the example, and a base material.

[0013]The navigational panel comprises the panel sheet 1, the circuit board 2, the base material 3, the elastic member 4, and the pressure absorption member 6, The base material 3 has stored the hard circuit board 2 which consists of the upper case 3a and the lower case 3b, and consists of glass epoxy resin in the space formed in the front face of the upper case 3a with the panel sheet 1, the upper case 3a, and the lower case 3b.

[0014]The panel sheet 1 is tabular voice which consists of polyethylene terephthalate of a synthetic resin and has pliability.

The four eminent convex final controlling elements 11 in which pressing operation is possible are beforehand formed by an operator with embossing.

The indicator 12 which is from the sign which shows the function of the final controlling element 11, a character, etc. on the surface side of the panel sheet 1 is printed in the neighborhood of the final controlling element 11.

The bonded seal material which is not illustrated into field portions other than final controlling element 11 is applied to the panel sheet 1 rear-face side, and it is stuck on the front face of the base material 3 mentioned later.

[0015]The circuit board 2 performs electric control of construction machinery, and it is allocating the switch 22 in the part corresponding to the final controlling element 11 of the panel sheet 1 while it has the printed wiring and the electronic parts 21 which are not illustrated. In this example, the switch 22 is a tact switch. According to the electric change by opening and closing of the switch 22, corresponding machine control is urged to the circuit board 2.

[0016]The base material 3 consists of synthetic resins, such as polycarbonate, and the operating hole 31, the vent 32, and the aeration way 33 are formed in the front-face side of the base material 3. So that the operating hole 31 may be penetrated from the front-face side of the base material 3 to the back side, four may be formed so that the final controlling element 11 may be countered, and the vent 32 may counter one panel sheet other than final controlling element 11, It is formed so that it may penetrate from the front-face side to the back side, and by this example, operating hole 31, vent 32, and operating hole 31 comrades are connected by the aeration way 33, enable aeration of the operating hole 31 and the vent 32, and they are formed in the groove so that it may connect with the vent 32 from any operating hole 31.

[0017]The restraining member 5 provided with the opening 51 which the part which consists of synthetic resin materials and counters the operating hole 31 of the base material 3 with the circuit board 2 penetrated is stored by base material 3 inside, and this restraining member 5 is being fixed to it so that the circuit board 2 may be stuck to the upper case 3a by fixing on the screw 7. Fixed holding of the restraining member 5 can be carried out to the upper case 3a by methods, such as

engagement by the hook which is not illustrated, hot welding, ultrasonic welding.

[0018]The elastic member 4 has elasticity, such as silicone rubber, and consists of a waterproof raw material, and The operation shaft part 41, It is made easy vertically to bend by forming the fixed-type-landing-gear part 42 surrounding the perimeter of this operation shaft part 41, using as thin meat the flexible region 43 which connects the operation shaft part 41 and the fixed-type-landing-gear part 42, and forming it in the operation shaft part 41. The operation shaft part 41 tells press of the final controlling element 11 to the switch 22, counters with the final controlling element 11, and it is provided so that it may be located in the operating hole 31 of the base material 3. The fixed-type-landing-gear part 42 fixes the elastic member 4 to the base material 3, it is putting by the base material 3 and the restraining member 5, and the back side (drawing 1 Nakashita side) of the operating hole 31 is sealed by the elastic member 4 by a closure watertight state without a crevice.

[0019]Like the elastic member 4, the pressure absorption member 6 has elasticity, such as silicone rubber, and consists of a waterproof raw material, is provided with the pressure absorption part 61 which changes by change of a pressure, is put between 32 vents of the base material 3 by the base material 3 and the restraining member 5, and is being fixed to them by the watertight state. The pressure absorption part 61 is usually the tubed voice of an ellipse form, and when expanding in response to a pressure, it changes into a cylindrical shape.

[0020]Thus, when the air which exists in the closed space formed with the base material 3, the elastic member 4, and the panel sheet 1 contracts in connection with the temperature change of the open air by having formed the pressure absorption member 6 in the vent 32. When the pressure absorption part 61 fades, it can prevent changing into the state where collapsed the final controlling element 31 of the panel sheet 1, or the elastic member 4 was thrust up, and in the case of pressing operation, change cannot be given to the operation feeling which gets across to a fingertip, but a fixed feeling can always be given. When it expands, and the pressure absorption part 61 expands, the fault of preventing modification of the panel sheet 1 or the panel sheet 1 exfoliating from the base material 3 can be prevented.

[0021]Therefore, waterproofness is high and the navigational panel which prevents modification of the panel sheet 11 etc. can be provided.

[0022]By having used the pressure absorption member 6 as waterproof raw material, and having fixed to the base material 3 by the watertight state, The adhesive power of said bonded seal material which is fixing the panel sheet 1 to the base material 3 declines according to aging etc. temporarily, and the panel sheet 1 exfoliates, Even when the vent 32 is exposed, or water permeates between the panel sheet 1 and the base material 3 and water etc. permeate into the vent 32, permeation of water can be pressed down by the pressure absorption member 6.

[0023]The section of the navigational panel in the 2nd example of this invention is shown, drawing 3 is equivalent to said 1st example, and a same sign describes a considerable part and it omits explanation.

[0024]The pressure absorption member 6 is formed in one of two or more the elastic members 4 in this example. Thus, by having formed in the elastic member 4, the pressure absorption member 6, and one, part mark can be reduced, cost can be reduced by extension, and a cheap navigational panel can be provided.

[0025]In this example, although the pressure absorption member 6 was formed in one of the elastic members 4, what formed two or more elastic members 4 and pressure absorption members 6 in one may be used.

[0026]The section of the navigational panel in the 3rd example of this invention is shown, drawing 4 is equivalent to said each example, and a same sign describes a considerable part and it omits explanation.

[0027]In this example, what made the operating hole 31 and the vent 32 the same breakthrough, and connected the operating hole 31 and the vent 32 may be used. While being able to connect the operating hole 31 and the vent 32 by constituting in this way, it is not necessary to form the

breakthrough of vent 32 exclusive use in the base material 3, and the base material 3 can be made into an easy structure.

[0028]Although it was the composition of having formed the one pressure absorption part 61 to two or more operating holes 31, in said each example, it is good also as composition which makes the operating hole 31 and the vent 32 the same breakthrough, and forms the pressure absorption part 61 to each operating hole 31 like the 3rd example, respectively. Since it is not necessary to form in the base material 3 the aeration way 33 which connects operating hole 31 comrades by constituting in this way, the base material 3 can be made into an easy structure.

[0029]Although not illustrated, what prepared the flexible region 43 of the elastic member 4 the pressure absorption part 61 may be used.

[0030]Although it was the composition of having formed two or more operating holes 31 corresponding to two or more preparations and the final controlling element 11 for the final controlling element 11, in said each example, it cannot be overemphasized that the final controlling element 11 may apply this invention to one navigational panel.

[0031]

[Effect of the Invention]As mentioned above, by this invention, the early purpose can be attained, waterproofness is high and the navigational panel which moreover prevents modification of a panel sheet etc. can be provided.

---

[Translation done.]

\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

---

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a sectional view of the navigational panel in the 1st example of this invention.

[Drawing 2]It is an important section exploded perspective view of the panel sheet of the example, and a base material.

[Drawing 3]It is a sectional view of the navigational panel in the 2nd example of this invention.

[Drawing 4]It is a sectional view of the navigational panel in the 3rd example of this invention.

[Drawing 5]It is an important section sectional view of the conventional navigational panel.

[Description of Notations]

1 Panel sheet

11 Final controlling element

2 Circuit board

22 Switch

3 Base material

31 Operating hole

32 Vent

33 Aeration way

4 Elastic member  
 41 Operation shaft part  
 6 Pressure absorption member  
 61 Pressure absorption part

[Translation done.]

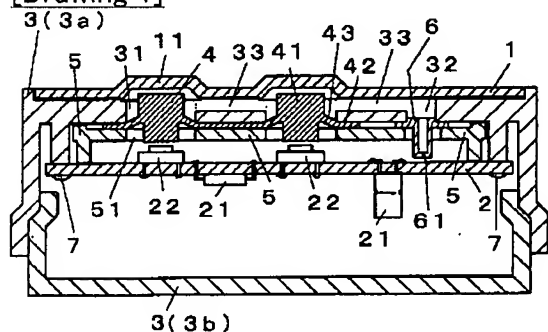
\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

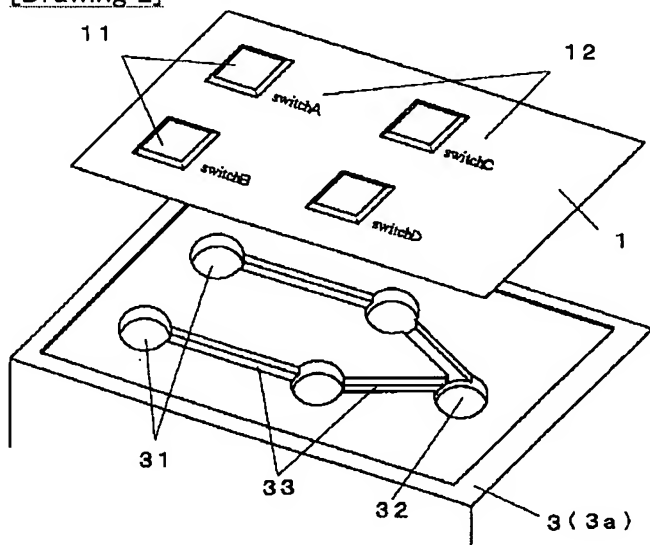
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

**DRAWINGS**

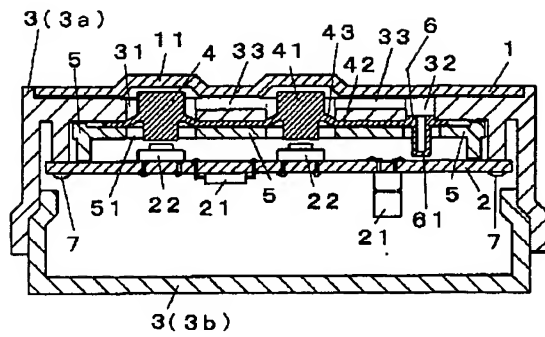
[Drawing 1]



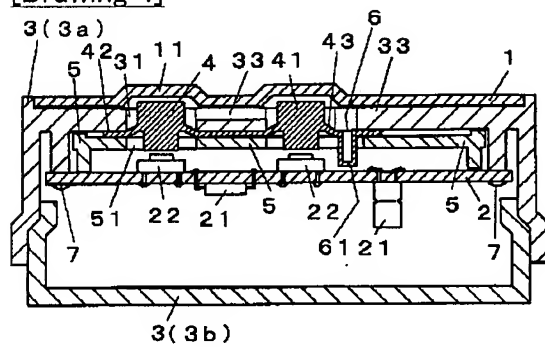
[Drawing 2]



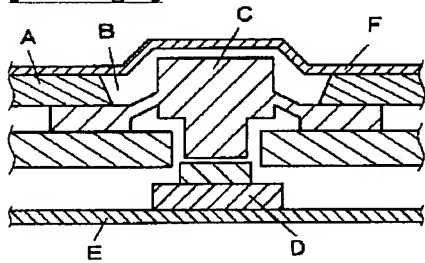
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]



**書誌**

(19)【発行国】日本国特許庁(JP)  
(12)【公報種別】公開特許公報(A)  
(11)【公開番号】特開2001-266695(P2001-266695A)  
(43)【公開日】平成13年9月28日(2001. 9. 28)  
(54)【発明の名称】操作パネル  
(51)【国際特許分類第7版】

H01H 13/04  
G06F 3/02 310  
H01H 13/06

**【FI】**

H01H 13/04 A  
G06F 3/02 310 Z  
H01H 13/06 B

【審査請求】未請求

【請求項の数】3

【出願形態】OL

【全頁数】5

(21)【出願番号】特願2000-84755(P2000-84755)

(22)【出願日】平成12年3月22日(2000. 3. 22)

(71)【出願人】

【識別番号】000231512

【氏名又は名称】日本精機株式会社

【住所又は居所】新潟県長岡市東蔵王2丁目2番34号

(72)【発明者】

【氏名】村山 幸平

【住所又は居所】新潟県長岡市東蔵王2丁目2番34号 日本精機株式会社内

【テーマコード(参考)】

5B020  
5G006

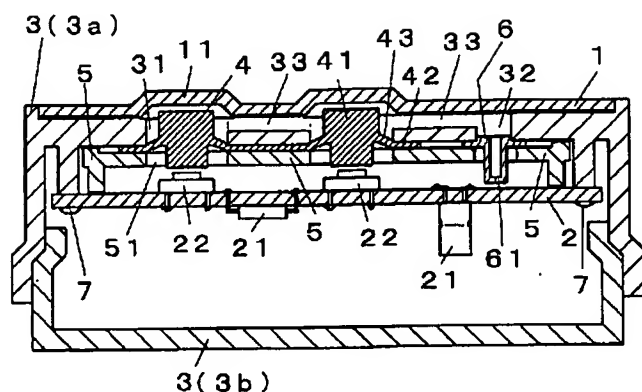
【Fターム(参考)】

5B020 BB05 DD02 DD32  
5G006 AZ09 CB05 CD04 CD07 DD05 FB06 FB19 FB32 FB33 LG02 LG07  
**要約**

(57)【要約】

【課題】防水性が高く、パネルシートの変形などを防止する操作パネルを提供する。

【解決手段】押圧操作により弾性変形可能な操作部11を有するパネルシート1と、パネルシート1の背面側に位置し操作部11に対応して開口する操作孔31とパネルシート1の背面側に位置し貫通形成される通気孔32とを有する支持体3と、操作部11に対応する箇所にスイッチ22を有する回路基板2と、操作部11の押圧操作に応じてスイッチ22を作動させる操作軸部41を有するとともに操作孔31を支持体3の背面側から塞ぐ弾性部材4とを備え、支持体3の前面側に操作孔31と通気孔32とを繋ぐ通気路33を設け、通気孔32に空気圧力変化を吸収する圧力吸収部61を有する圧力吸収部材6を設けたものである。



## 請求の範囲

### 【特許請求の範囲】

【請求項1】 押圧操作により弾性変形可能な操作部を有するパネルシートと、前記パネルシートの背面側に位置し前記操作部に対応して開口する操作孔と前記パネルシートの背面側に位置し貫通形成される通気孔とを有する支持体と、前記操作部に対応する箇所にスイッチを有する回路基板と、前記操作部の押圧操作に応じて前記スイッチを作動させる操作軸部を有するとともに前記操作孔を前記支持体の背面側から塞ぐ弾性部材とを備え、前記操作孔と前記通気孔とを繋ぎ、前記通気孔に空気圧力変化を吸収する圧力吸収部を有する圧力吸収部材を設けたことを特徴とする操作パネル。

【請求項2】 前記圧力吸収部材が防水性を備え、前記支持体に水密状態で固定されていることを特徴とする請求項1記載の操作パネル。

【請求項3】 前記圧力吸収部材が前記弾性部材と一体に形成されていることを特徴とする請求項2記載の操作パネル。

## 詳細な説明

### 【発明の詳細な説明】

#### 【0001】

【発明の属する技術分野】本発明は、建設機械などの特殊車輛や船舶、あるいは自動車等の車輛またはリモコンやコピー機械などの電子機器などに装備され、パネルシート(表示基板)上の操作部を指先にて押圧操作することによって機器を操作するようにした操作パネルに関する。

#### 【0002】

【従来の技術】一般に、この種の操作パネルを採用する装置は、例えば、建設機械などの特殊車輛や船舶などに用いられるため、装置内部に水や誇りが入り込まないよう気密性の高い構造を採用している。

【0003】特に前記装置においてはその内部に回路基板を収納するものが一般的であって、雨ざらしなどの環境下で使用される操作パネルにあっては操作部からの雨水などの浸入を防止すべく気密性を考慮した操作部を備える必要がある。そこで操作部を一枚の弾性を有する薄板状のパネルシートによって構成し、前記装置の気密性を高めるものがある(例えば、特開平8-7162号)。

【0004】しかしながら、このようなパネルシートを用いた構造であっても、薄板状のパネルシートに傷や割れが生じる可能性があり、傷や割れの部分から水や埃が前記装置内部へ入り込み、回路基板が破損してしまう虞があった。そこで、図4に示すように、装置を構成する支持体Aを貫通する操作孔Bを背面側から弾性部材Cで塞ぎ、前面(図中上)側からスイッチDを有する回路基板Eを備えた装置内部に水などが浸入するのを防ぎ、パネルシートFとともに二重の防水構造をとるものが知られている。

#### 【0005】

【発明が解決しようとする課題】しかしながら、この構造は支持体Aと弾性部材CとパネルシートFとに

よって密閉された空間が形成され、この空間内に存在する空気が外気の温度変化にともない膨張、収縮することがあり、収縮した空気によって、パネルシートの操作部を陥没させたり、弾性部材を突き上げた状態にすることがあり、押圧操作の際、指先に伝わる操作フィーリングが通常と異なってしまうだけでなく、膨張した空気の圧力によって、パネルシートFが伸びきってしまい元の形状に戻らなかったり、支持体AからパネルシートFを剥がしてしまうなどの不具合が生じる虞があった。

【0006】そこで、本発明は、防水性が高く、しかもパネルシートの変形などの破損を防止する操作パネルを提供することを目的としている。

【0007】

【課題を解決するための手段】本発明は、押圧操作により弾性変形可能な操作部を有するパネルシートと、前記パネルシートの背面側に位置し前記操作部に対応して開口する操作孔と前記パネルシートの背面側に位置し貫通形成される通気孔とを有する支持体と、前記操作部に対応する箇所にスイッチを有する回路基板と、前記操作部の押圧操作に応じて前記スイッチを作動させる操作軸部を有するとともに前記操作孔を前記支持体の背面側から塞ぐ弾性部材とを備え、前記操作孔と前記通気孔とを繋ぐ、前記通気孔に空気圧力変化を吸収する圧力吸収部を有する圧力吸収部材を設けたものである。

【0008】また、前記圧力吸収部材が防水性を備え、前記支持体に水密状態で固定されているものである。

【0009】また、前記圧力吸収部材が前記弾性部材と一体に形成されているものである。

【発明の実施の形態】本発明による操作パネルは、押圧操作により弾性変形可能な操作部11を有するパネルシート1と、パネルシート1の背面側に位置し操作部11に対応して開口する操作孔31とパネルシート1の背面側に位置し貫通形成される通気孔32とを有する支持体3と、操作部11に対応する箇所にスイッチ22を有する回路基板2と、操作部11の押圧操作に応じてスイッチ22を作動させる操作軸部41を有するとともに操作孔31を支持体3の背面側から塞ぐ弾性部材4とを備え、支持体3の前面側に操作孔31と通気孔32とを繋ぐ通気路33を設け、通気孔32に空気圧力変化を吸収する圧力吸収部61を有する圧力吸収部材6を設けたものである。このように構成することにより、防水性が高く、かつ、膨張した空気の圧力を圧力吸収部61で吸収することができパネルシート1の変形などを防ぐことができる。

【0010】また、圧力吸収部材6が防水性を備え、支持体3に水密状態で固定されているものである。このように構成することにより、経年変化などにより、パネルシート1が支持体3から剥離し、通気孔32が露出し水などが通気孔32内に浸入した場合でも、圧力吸収部材6で水の浸入を押さえることができる。

【0011】また、圧力吸収部材6が弾性部材4と一体に形成されているものである。このように構成することにより、部品点数を削減することができ、コストを削減することができ、安価に操作パネルと提供することができる。

【0012】

【実施例】以下、添付図面に基づいて、建設機械を制御操作するための操作パネルを例に挙げ説明する。図1は本発明の第1実施例における操作パネルの断面図を示し、図2は同実施例のパネルシートと支持体の要部分解斜視図である。

【0013】操作パネルはパネルシート1、回路基板2、支持体3、弾性部材4及び圧力吸収部材6とから構成されており、支持体3は上ケース3aと下ケース3bからなり、上ケース3aの前面にパネルシート1、上ケース3aと下ケース3bとで形成される空間内にガラスエポキシ樹脂からなる硬質の回路基板2を収納している。

【0014】パネルシート1は、合成樹脂のポリエチレンテレフタレートからなり、柔軟性を有する板状態であり、予めエンボス加工によって操作者により押圧操作可能な隆起した凸状の4つの操作部11を形成してなる。また、パネルシート1の表面側には、操作部11の機能を示す記号や文字などからなる表示部12が、操作部11の近辺に印刷されており、パネルシート1裏面側には操作部11以外の面部分に図示しない接着シール材が塗布され、後述する支持体3の前面に貼り付けられている。

【0015】回路基板2は、建設機械の電氣的な制御を行うもので、図示しない印刷配線や電子部品21を有するとともにパネルシート1の操作部11に対応する箇所にはスイッチ22を配設している。本実施例ではスイッチ22はタクトスイッチである。回路基板2は、スイッチ22の開閉による電氣的な変化に

応じて、対応する機械制御を促している。

【0016】支持体3は、ポリカーボネードなどの合成樹脂からなり、支持体3の前面側に操作孔31、通気孔32、通気路33が形成されている。操作孔31は支持体3の前面側から背面側に貫通しており、操作部11に対向するように4つ形成され、通気孔32は操作部11以外のパネルシート1箇所に対向するように、前面側から背面側に貫通するように形成され、本実施例では、操作孔31と通気孔32、及び操作孔31同士は通気路33により繋がれており、操作孔31と通気孔32とを通気可能にするもので、何れの操作孔31からも通気孔32へ連結するように溝状に形成されている。

【0017】また、支持体3内部には、回路基盤2とともに、合成樹脂材からなり支持体3の操作孔31に対向する箇所が貫通した開口51を備えた抑え部材5が収納され、この抑え部材5は、回路基盤2をビス7で固定することによって上ケース3aに密着するように固定されている。なお、抑え部材5は、図示しないフックによる係合や熱溶着、超音波溶着などの方法によって上ケース3aに固定保持することができる。

【0018】弾性部材4はシリコンゴムなどの弾性を有し、且つ防水性の素材からなり、操作軸部41と、この操作軸部41の全周を囲む固定脚部42とを形成しており、操作軸部41と固定脚部42とを繋ぐ可動部43を薄肉にして形成することで操作軸部41を上下へ撓み易くしている。操作軸部41は、操作部11の押圧をスイッチ22に伝えるもので、操作部11と対向して、支持体3の操作孔31に位置するように設けられている。また、固定脚部42は、弾性部材4を支持体3に固定するもので、支持体3と抑え部材5とによって挟み込むことで、操作孔31の背後側(図1中下側)が弾性部材4によって隙間なく塞がり水密状態で密閉される。

【0019】圧力吸収部材6は弾性部材4と同様に、シリコンゴムなどの弾性を有し、且つ防水性の素材からなり、圧力の変化により変形する圧力吸収部61を備えているもので、支持体3の通気孔32箇所に、支持体3と抑え部材5によって挟み込んで水密状態で固定されている。圧力吸収部61は通常は楕円形の筒状であり、圧力を受けて膨張する場合は、円柱形に変形する。

【0020】このように、通気孔32に圧力吸収部材6を設けたことで、支持体3と弾性部材4とパネルシート1とによって形成された密閉空間内に存在する空気が外気の温度変化にともない収縮した場合には、圧力吸収部61がしぼむことにより、パネルシート1の操作部31を陥没させたり、弾性部材4を突き上げた状態にすることを防止することができ、押圧操作の際、指先に伝わる操作フィーリングに変化を与えず常に一定のフィーリングを与えることができる。また、膨張した場合には、圧力吸収部61が膨張することにより、パネルシート1の変形を防止したり、支持体3からパネルシート1が剥離するなどの不具合を防止することができる。

【0021】よって、防水性が高く、パネルシート11の変形などを防止する操作パネルを提供することができる。

【0022】また、圧力吸収部材6を防水性の素材とし、支持体3に水密状態で固定したことにより、仮に、パネルシート1を支持体3に固定している前記接着シール材の粘着力が経年変化などにより低下してパネルシート1が剥離し、通気孔32が露出したり、パネルシート1と支持体3との間に水が浸入し、通気孔32内に水などが浸入した場合でも、圧力吸収部材6で水の浸入を押さえることができる。

【0023】図3は本発明の第2実施例における操作パネルの断面を示し、前記第1実施例と同等及び相当箇所については同符号で記し説明を省く。

【0024】本実施例では、複数ある弾性部材4の一つに圧力吸収部材6を形成したものである。このように、弾性部材4と圧力吸収部材6と一体に形成したことにより、部品点数を削減することができ、ひいてはコストを削減することができ、安価な操作パネルを提供することができる。

【0025】なお、本実施例では、弾性部材4の一つに圧力吸収部材6を形成したが、複数の弾性部材4と圧力吸収部材6とを一体に形成したものでよい。

【0026】また、図4は本発明の第3実施例における操作パネルの断面を示し、前記各実施例と同等及び相当箇所については同符号で記し説明を省く。

【0027】本実施例では、操作孔31と通気孔32を同一の貫通孔とし、操作孔31と通気孔32とを繋いだものでもよい。このように構成することにより、操作孔31と通気孔32とを繋ぐことができるとともに、支持体3に通気孔32専用の貫通孔を形成しなくともよく、支持体3を簡単な構造とすることができる。

【0028】なお、前記各実施例では、複数の操作孔31に対して、1つの圧力吸収部61を設けた構成であったが、第3実施例のように、操作孔31と通気孔32を同一の貫通孔とし、各操作孔31に対し

て、それぞれ圧力吸収部61を設ける構成としてもよい。このように構成することにより、操作孔31同士を繋ぐ通気路33を支持体3に形成しなくともよいので、支持体3を簡単な構造とすることができる。【0029】また、図示していないが、弾性部材4の可動部43に圧力吸収部61を設けたものでもよい。【0030】なお、前記各実施例では、操作部11を複数備え、操作部11に対応する操作孔31を複数設けた構成であったが、操作部11が1つの操作パネルに本発明を適用してもよいことは言うまでもない。

【0031】

【発明の効果】以上、本発明により、初期の目的を達成することができ、防水性が高く、しかもパネルシートの変形などを防止する操作パネルを提供することができる。

## 図の説明

【図面の簡単な説明】

【図1】本発明の第1実施例における操作パネルの断面図である。

【図2】同実施例のパネルシートと支持体の要部分解斜視図である。

【図3】本発明の第2実施例における操作パネルの断面図である。

【図4】本発明の第3実施例における操作パネルの断面図である。

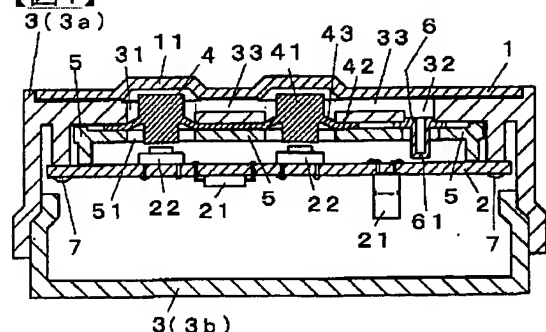
【図5】従来の操作パネルの要部断面図である。

【符号の説明】

- 1 パネルシート
- 11 操作部
- 2 回路基板
- 22 スイッチ
- 3 支持体
- 31 操作孔
- 32 通気孔
- 33 通気路
- 4 弾性部材
- 41 操作軸部
- 6 圧力吸収部材
- 61 圧力吸収部

## 図面

【図1】



【図2】

